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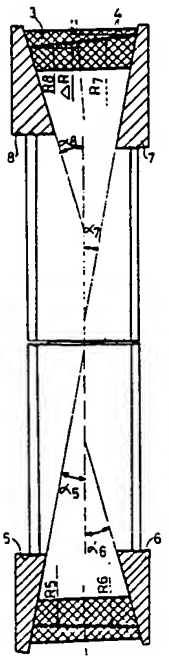
(54) Title: INFINITELY VARIABLE GEAR

(57) Abstract

The invention relates to an infinitely variable gear with which the belt pulleys arranged on the driving shaft and on the driven shaft carrying the all around running V-belt consist of the pulley-half each fixed rigidly onto the shaft and of the pulley-half which can be displaced axially in respect to the fixed pulley-half. The essential characteristic of the infinitely variable gear according to the invention lies in that the V-belt (3) is formed with cord fibres (4) as reinforcing insert embedded in the elastic material of the belt along the cone mantle, enclosed by the sides of the pulley-halves (5, 6, 7, 8) facing each other and formed with different half-cone angles (α_5, α_6, α_7, α_8).



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Infinitely variable gear

Technical field

The invention relates to an infinitely variable gear with which the belt pulleys arranged on the driving shaft and on the driven shaft carrying the all around running V-belt consists of the half-pulley each fixed rigidly onto the shaft and of the pulley-half which can be displaced axially in respect to the fixed pulley-half each.

Background Art

Gears working with belt pulleys formed of two pulley-halves each are well known, with which the movable pulley-halves are moved by means of hydraulic structural parts arranged along their shaft. These solutions are known e.g. from the patents US-PS 3 623 377 and the German Patent DE-OS 2 703 488. The disadvantageous characteristic of said constructions lies in that the actuating hydraulic structural part increases considerably costs of production, simultaneously space requirement and weight of the gear are also increased. The hydraulic structural parts get damaged rather frequently, as a consequence, trouble possibilities and frequency of breakdown are significantly increased, simultaneously safety of operation decreases.

With another known solution the belt pulley halves arranged on the driving shaft are pressed towards each other by a spring, while the movable pulley-halves arranged on the driven shaft are pressed by a coil spring widening resp. moving outwards upon the effect of the centrifugal force, or by a structural part with cam towards the belt pulley-half fixed on the shaft. The drawback of this solution lies in that the coil spring gets damaged in a short operative period, the construction with the cam gets

worn very quickly, as a consequence, function of the gear does not meet the requirements anymore.

The common drawback of all the known gear types lies in that the pulley-halves when approaching each other are simultaneously turning in relation to one another, while between the conical surfaces of the belt pulley-halves and the sidewall of the belt a slip will arise resulting in a considerable frictional and abrasive effect. As a consequence of the slip causing the considerable friction the belt is warmed up, it loses partially its elastic characteristics, wears off, its width decreases, useful life will be shorter, simultaneously range of transmission is changing too.

The task of the invention is to develop an infinitely variable gear as previously described, with an inconsiderable space requirement and weight, not tending to failure, production costs should be relatively low; a further requirement lies in that in course of operation slips must not arise between the belt pulley-halves and the sidewalls of the belt which could lead to warming up of the belt, change of the elastic characteristics and dimensions respectively, accordingly, useful life can be significantly prolonged and transmission does not change even after using the belt for a long time.

Disclosure of Invention

In accordance with the invention the task was solved by developing an infinitely variable gear with which the belt pulleys arranged on the driving shaft and on the driven shaft carrying the all around running V-belt consist of the half-pulley each fixed rigidly onto the

shaft and of the pulley-half which can be displaced axially in respect to the fixed pulley-half each and which can be characterized in that as a reinforcing insert a V-belt is used which is reinforced with cord fibres and embedded into the elastic material along the cone mantle, enclosed by the sides of the belt pulley-halves facing each other and formed with different halved cone angles.

A further characteristic of the invention lies in that out of the driving shaft and the driven shaft at least on one of them, the axially movable belt pulley-half is connected via a half screw-thread to the shaft, and between the other belt pulley-half on the shaft and the shaft there is a free-running structural part.

A further characteristic lies in that between the belt pulley-half displaceable longitudinally on one of the shafts and the shaft there is a compression spring attached, removing the displaceable belt pulley-half from the pulley-half kept indisplaceably on the shaft, furtheron, on the other shaft there is another spring spanning the movable pulley-half towards the indisplaceable pulley-half.

The gear according to the invention can be advantageously used in cases too, in which a plurality of gear units is assembled with different known structural parts.

It is considered as advantageous, if the gear according to the invention is proved with a first gear unit having been arranged between the motor and the clutch, formed with belt pulleys arranged on the motor shaft and on the countershaft being parallel therewith, converting the changing moment into a constant moment, furtheron, if it

is provided with a second gear formed with belt pulleys arranged on the countershaft of the first gear and on the output shaft being parallel therewith, wherein prevailing transmission is set by the changing loading moment on the output shaft.

A solution is also possible, with which the gear is assembled of a first gear unit connected to the countershaft and two second gear units.

With a preferred embodiment of the invention a reverse and differential gear- comprising also the final transmission - is inserted into the shaft after the clutch.

A further characteristic lies in that the wheels of the driven wheel-pairs of the driven motor vehicle are separated and on the inner end of the shaft-halves belonging to the wheels there is a reverse gear containing also the final transmission and every one is connected through a belt drive each or any other similar means to the driving belt pulley of the clutch belonging to a second gear unit each, having been fixed onto the shaft facing the reverse gear.

Brief Description of Drawings

The infinitely variable gear according to the invention will be described in detail by means of preferable embodiments serving as examples, by the aid of the accompanying drawings, wherein:

Figure 1 is the schematical cross-section of a traditional V-belt,

Figure 2 the sectional view of the V-belt applied in the gear according to the invention,

Figure 3 illustrates the V-belt applied in the gear according to the invention, positioned between the belt pulley-halves,

Figure 4 is a sectional partial view of one of the embodiments of the gear according to the invention,

Figure 5 is a partial sectional view along the line V-V of figure 4,

Figure 6 is the schematical view of the combination of the infinitely variable gear according to the invention which is suitable for the simultaneous and unidirectional drive of two driven wheels of a motor vehicle,

Figure 7 shows the theoretical scheme of a combined embodiment which is able to drive two wheels of a motor vehicle simultaneously, unidirectionally, or simultaneously and in different directions, or to drive only one wheel of the vehicle simultaneously, in any optional direction.

Best Mode of Carrying out the Invention

Figure 1 illustrates the sectional view of a V-belt 1, which has the usual structural layout. The cord fibres 2 forming the reinforcing insert are embedded into the V-belt 1 made of rubber or some synthetic material, said fibres are arranged in the cylinder mantle formed around the imaginary axis of the V-belt 1, that means that the diameters measurable in the adjacent planes being perpendicular to the imaginary axis are identical.

In respect to external appearance the V-belt 3 applied

in the gear according to the invention, illustrated in figure 2 conforms to the external appearance of the V-belt 1. Two outer sides of the V-belt 3 are symmetrical in relation to the medium plane and half-cone angles α are also identical and equal on both sides of the medium plane. The V-belt 3 differs in so far from the V-belt 1 that - as it becomes obvious from the section - the adjacent cord fibres 4 are not arranged along the cylinder mantle but along the cone mantle. Out of the cord fibres 4 forming the reinforcing insert the inner diameter D_B and the outer diameter D_K of the two extreme fibres are different.

In figure 3 the V-belt 3 is to be seen in the stretched state between two belt pulleys, as contained in the gear. One of them, e.g. the driving belt pulley consists of the pulley-halves 5 and 6, while the other, the driven belt pulley is assembled of the pulley-halves 7 and 8. The V-belt 3 is spanned so that the cord fibres 4 should lie between the driving pulley-halves 5 and 6, on the cylinder mantle around the shaft of the driving belt pulley ($R_5 = R_6$), while between the belt pulley-halves they lie along the cone mantle. In the sections between the two extreme positions - as it is to be seen in figure 3 - the cord fibres 4 are arranged in provisional positions between the lower and the upper extreme position, said positions are continuously changing in course of revolution of the V-belt 3 in the single tracts of the V-belt. This change is enabled by the slight deformation of the V-belt during the rotary motion.

The reason of the orientation of the cord fibres 4 in the V-belt 3 lies in that the inner half-cone angles

of the pulley-halves 5, 6, 7 and 8 are different. Magnitude of the half-cone angles $\alpha 5$, α_6, α_7, α_8 depends essentially on the half-cone angles α to be measured in the condition prior to arranging the V-belt 3, as well as on the cone angle of the cord fibres 4 according to figure 2, resp. on the value $D_K - D_B$. With the arrangement according to figure 3 radii R_5 and R_6 of the cord fibres 4 are equal, while the radii R_7 resp. R_8 of the two extreme cord fibres 4 are the radii of the cord fibres being practically in contact with the upper driven belt pulley-halves 7 and 8; from these we obtain that

$$D_K - D_B \cong R_7 - R_8 \cong \Delta R$$

From all what has been said it becomes obvious that at the arrangement according to figure 3 the cross-section of the V-belt 3 remains practically the same at the bottom and the top of the figure, as in figure 2, substantially the sides of the V-belt 3 are lying regularly in the grooves between the driving belt pulley-halves and the driven pulley-halves 7 and 8. The mutual relation between the half-cone angles α of the belt pulley-halves 5, 6, 7 and 8 and the untightened V-belt outside the belt-pulleys is, as follows:

$$\alpha 7 < \alpha 5 < \alpha < \alpha 6 < \alpha 8$$

When choosing these dimensions and angles, respectively, groove-sides of the belt pulley-halves, 5, 6, 7 and 8 will always lie to the sides of the V-belt 3 and they will rotate next to each other practically without any slips.

With the gear to be seen in figure 4 the driving moment arrives to the driving shaft 10 as shown by the arrow 9.

The shaft 10 and the belt-pulley-half 5 having been fixed thereto in a way known in itself are supported by the rolling bearing 12 in the house 11 in a rotatably way. The belt pulley-half 5 is unable to move along the shaft 10, it co-rotates with the shaft 10. From the pulley-half 5 inwards the shaft 10 is formed as a part of the finned shaft 13 on which the belt pulley-half 6 can be displaced axially. On the outer endface of the finned shaft 13 the end-disc 14 is fixed in any known way. Around the shoulder 15 of the pulley-half 6 and the part formed by the finned shaft 13, between the belt pulley-half 6 and the end-disc 14 the spring 16 - made of a tubular rubber body or a steel wire-spiral - is intercepted which spans the pulley-half 6 continuously towards the belt pulley-half 5.

Via the shouldered rolling bearing 18 and the free-running structural part 19 the pulley-half 7 is fixed onto the driven shaft 17. In the closing state of the free-running structural part 19 the belt pulley-half 7 co-rotates with the shaft 17, while in the open state of the free-running structural part 19 it is able to turn in relation to the shaft 17. The belt pulley-half 7 cannot be displaced, however, longitudinally on the shaft 17.

On the part of the driven shaft 17 lying within the pulley-half 8 there is the screw-thread 20 with left-hand thread engaging with the corresponding female thread of the pulley-half 8. The belt pulley-half 8 may turn on the shaft 17 and in dependence of the direction of turn it may approach to or leave from the

pulley-half 7. The sleeve 21 is fixed rigidly to the outer side of the belt pulley-half 8, on the outer end-part there is the female-thread 22 to be found. The thread on the outer surface of the sleeve-part of the carrier disc 23 engages with the female-thread 22. The sleeve 24 is fixed rigidly onto the left-side end of the shaft 17 with a screw, the inner end of said sleeve carries the supporting ring 25 fixed rigidly thereto. The cushion ring 26 is fixed rigidly to the inner side of the supporting ring 25, around the screw-thread 20. Next to the surfaces of the sleeve 23 and the supporting ring 25 facing each other the slide ring 27 each - made of steel or teflon and formed with a smooth surface - is arranged, these enclose the spring 28 made of a tubular rubber material or steel spiral. The sleeve 24, the supporting ring 25 and the cushion ring 26 co-rotate with the shaft 17, while the sleeve 21 and the carrier disc 23 co-rotate with the belt pulley-half 8. Slide rings 27 and the spring 28 may co-rotate with any of them.

When the driving shaft 10 is rotated with a constant input moment, the belt pulley-halves 5 and 6 are pressed by the spring 16, the pulley-halves 7 and 8 by the ring 28 to the side of the V-belt 3 sandwiched inbetween. In the two branches of the V-belt 3 pulling forces arise, which will be defined by the output moment prevailing on the shaft 17. In course of continuous operation the input moment rotating the shaft 10 stays in equilibrum with the sum of output moment and loss of drive, being in compliance with the lower and upper position of the V-belt (see figure 4 sectional view) between the corresponding belt pulley-halves 5-8 and the radial distance measured from the axis of the belt pulleys.

Now the belt pulley-half co-rotates with an identical number of revolutions with the shaft 17, its position does not change in the longitudinal direction of the shaft 17, furtheron, the belt pulley-half is also co-rotating with the pulley-half 8, as the free-running structural part 19 occupies its open position.

In case, if a driven apparatus or driven from the output shaft thereof or any other similar means require the transmit of a moment surpassing the previous one, the rotation of the shaft 17 becomes slower, the roller (to be seen in figure 5) of the free-running construction is sticking between the shoulder of the rolling bearing 18 and the pulley-half 7, it closes, meanwhile the belt pulley-half 7 hurries forward in respect to the shaft 17 and carries with itself the pulley-half 8 by means of the V-belt 3, said pulley-half is turning on the shaft 17 by means of the screwthread 20 and approaches to the pulley-half 7. When the pulley-halves 7 and 8 are approaching to each other, the V-belt 3 is sliding radially outwards, as a consequence, the force arm of the moment having been transferred by the V-belt to the belt pulley-halves 7 and 8 and therethrough to the shaft 17 and simultaneously the moment itself increase. If the increase in moment thus achieved does not suffice for transmitting the moment required on the shaft 17, the V-belt 3 turns the pulley-half 8 as long on the shaft 17, as the V-belt 3 arrives at the position with the radius needed for the transfer of the desired moment. Simultaneously, the part of the V-belt lying between the belt pulley-halves 5 and 6, respectively, approaches the shaft of the pulley-halves 5 and 6, the radius of this part decreases, the pulley-

half 6 sliding outwards on the finned shaft 13 moves away from the belt pulley-half 5 against the compressive force of the spring 16.

In case, in which the magnitude of the moment required by the shaft 17 decreases, the more, a moment arises which affects in the direction of rotation of the shaft 17 (e.g. when braking the motor), the shaft 17 and the pulley-half 8 hurry forward in respect to the pulley-half 7 and upon the effect of the V-belt 3 the belt pulley-half 8 is turning on the shaft 17 so that meanwhile it moves away from the pulley-half 7, simultaneously the radial distance between the V-belt 3 and the shaft of the pulley-halves 7 and 8 decreases. This process is continued as long as the outer surface of the belt pulley-half 8 impects on the cushion ring 26, meanwhile the part of the V-belt 3 lying between the pulley-halves 5 and 6 moves more and more outwards and farther from the shaft of the belt pulley-halves 5 and 6, as the compression spring 16 moves the pulley-half 6 towards the pulley-half 5. In such a manner the originally driven shaft 17 may become a driving shaft, while the driving shaft 10 may become a driven shaft.

Now, when the belt pulley-half 8 approaches to the belt pulley-half 7 the spring 28 is compressed, it reduces the axial force acting on the pulley-half 8 from the direction of the pulley-half 7, furtheron, by decreasing the moment transferred by the shaft 17 reverse motion of the pulley-half 8 will be promoted. The spring 28 influences both sensitivity and response time of the gear, pre-stress thereof can be regulated by means of the sleeve 21 and the screw-thread of the supporting disc 23.

By virtue of the described arrangement of the cord fibres 4 we obtain a "differential" epicyclic gear which - in case of constant input number of revolutions and moment-produces at the change of the loading moment a changing transmission being in compliance therewith. In case of stabilized operation with the quick increase of input number of revolutions driving moment increasses rapidly, while the driven mass (e.g. a car) will be accelerated in an utmost short time.

Response time will be defined mainly by the shape and arrangement of the reinforcing insert consisting of the cord fibres 4, as well as by the half-cone angle of the belt pulley-halves 5, 6, 7 and 8. Deviations from the usual values do not exceed unconditionally the permissible deviations of the neutral length of the known standarized V-belts, i.e. the values of the tolerance range allowed for the angular deviation of standarized belt-pulleys.

Figures 6 and 7 give two examples for the application of the gear according to the invention.

When applying the embodiment of the infinitely variable gear according to the invention as illustrated in figure 6, one of the belt pulleys of the first gear unit 31 according to figure 4 converting the changing moment into a constant moment is fixed onto the shaft 30 of the gasoline engine 29 delivering the changing moment. The other belt pulley of the first gear unit 31 is fixed onto the countershaft 32 running parallel with the shaft 30, as a consequence, the first gear unit 31 drives the countershaft 32 with a constant moment.

A further belt pulley is fixed onto the countershaft 32, said pulley represents one of the belt-pulleys of a second gear unit 33 converting the constant moment prevailing on the countershaft 32 into changing moment. The other belt pulley of the second gear unit 33 is fixed onto the output shaft 34, while on said output shaft 34 in course of the operation and run of the motor vehicle moments corresponding to prevailing demands and required for advance will arise.

Accordingly, the moment delivered always by the motor 29 yielding the changing moment the first gear unit 31 converts it into a constant moment on the countershaft 32, while this constant moment is converted by the second gear unit 33 into a changing moment, which is in compliance with the prevailing required moment arising on the output shaft 34.

On the output shaft 34, in the flow of force and moment, respectively, after the second gear unit 33 the clutch 35 is installed, being necessary for starting the vehicle and commuting the direction but it is not required for the continuous operation of the motor vehicle.

The previously specified structural arrangement can be used directly for driving single-wheel vehicles, so e.g. motorcycles having one wheel and similar vehicles. If we intend to drive vehicles with two-wheel drive, e.g. passanger cars or other motor vehicles, expediently a reverse gear 39 and a differential gear 40 can be built-in between the common shaft 37 of the clutch 35 and the two driven wheels 36.

Between the construction to be seen in figure 7 and the construction according figure 1 the essential difference lies in that with the structural construction according to figure 1 both driven wheels 36 are always driven simultaneously and always in the same direction, while with the other structural solution according to figure 2 the two wheels 36 are separated in respect to drive, they can be driven simultaneously in the same direction and in opposite directions too, however, it becomes possible to drive one single wheel 36 only.

With the solution according to figure 7 the countershaft 32 is connected to a first gear unit 31 and two second gear units 33. On the output shaft 34 of every second gear unit 34 there are a clutch 35 each and a belt-pulley or a toothed wheel belonging thereto, which are forming a part of a belt-drive 41 each resp. or a gear drive.

The shaft of the driven wheels 36 is separated in two, consequently, the weels 36 can be rotated independently of each other. At the inner end of the shaft-halves 38 of the single wheels 36 there is a second belt-pulley belonging to the belt-drive 41 arranged, resp. there is a second toothed wheel belonging to the gear drive, which can be assembled with the reverse gear 39 containing also the final transmission.

The main advantages of the infinitely variable gear according to the invention are, as follows:

Between the belt pulley-halves sensing the change in moment and accordingly performing the control of number of revolutions and change of transmission and the V-belt

sandwiched inbetween there is no detrimental slip, and if, slip is minimal, accordingly useful life of the V-belt can be considerably prolonged. Response to the change in the magnitude of the required moment is utmost quick, adaption to changes is taking place in a very short time. Practically it works far more reliably and with increased safety of operation in comparison to known solutions without separate costs. When applied for driving motor vehicles, equilibrium of moment remains unaltered inspite of changes in ways of operation, so consumption of fuel of the motor can be considered always, as ideal. Gear shifting "reverse" and "changing up" are intertwined, practically they occur simultaneously, resulting in energy savings and proper acceleration. Motor vehicle is turning on a smaller circle, than motor vehicles operated with the known gears. Wheels of the driving wheel-pair can be rotated independently of each other, as a consequence, the car can be driven even in this case, if only one of the driving wheels contacts the soil. Shaft coupling can be performed without jerks, decreasing the stress on several components of the motor vehicle, simultaneously comfort of travel in the car increases.

The invention is not at all restricted to the embodiments having been specified here. Components and structural parts of the embodiments described can be replaced by components resp. structural parts of similar function and effect without leaving the scope of the invention.

What we claim:

1. Infinitely variable gear with which the belt pulleys arranged on the driving shaft and on the driven shaft carrying the all around running V-belt consist of the pulley-half each fixed rigidly onto the shaft and of the pulley-half which can be displaced axially in respect to the fixed pulley-half each,
c h a r a c t e r i z e d in that the V-belt (3) is formed with cord fibres (4) as reinforcing insert embedded in the elastic material of the belt along the cone mantle, enclosed by the sides of the pulley-halves facing each other (5, 6, 7, 8) and formed with different half-cone angles (α_5, α_6, α_7, α_8).

2. Infinitely variable gear as claimed in claim 1,
c h a r a c t e r i z e d in that out of the driving shaft (10) and the driven shaft (17) on at least one of them the axially movable pulley-half (8) bearing up against one side of the V-belt (3) is connected to the shaft (17) via a screw-thread (20), and between the other belt pulley-half (7) arranged on said shaft (17) and the shaft (17) there is a free-running structural part (19).

3. Infinitely variable gear as claimed in claim 1 or 2,
c h a r a c t e r i z e d in that the movable pulley-half (18) having been fixed between one pulley-half (8) displaceable longitudinally on one of the shafts (17) and the shaft (17) is moved away from the pulley-half (7) fixed rigidly on the shaft (17) by means of a compression spring (28), furtheron there is another spring (16) spanning the movable pulley-half (6) on the other shaft (10) towards the rigidly kept pulley-half(5).

4. Infinitely variable gear as claimed in any of the claims 1 to 3, c h a r a c t e r i z e d in that several gear units are assembled with different known structural parts of gears.

5. Infinitely variable gear as claimed in any of the claims 1 to 4, c h a r a c t e r i z e d in that it contains a first gear unit (31) having been arranged between the motor (29) and the clutch (35) and formed with the pulleys on the shaft (30) of the motor (29) and on the countershaft (38) being parallel therewith and converting the changing moment into a constant moment, furtheron a second gear unit (33) is provided for, formed with belt-pulleys arranged on the countershaft (32) of the first gear unit (31) and on a further output shaft (34) being parallel therewith, while the prevailing transmission of the second gear unit (33) is set by the changing loading moment on the output shaft (34).

6. Infinitely variable gear as claimed in any of the claims 1 to 4, c h a r a c t e r i z e d in that a first gear unit (31) and two second gear units (33) are connected to the countershaft (32).

7. Infinitely variable gear as claimed in any of the claims 1 to 4, c h a r a c t e r i z e d in that into the shaft following the clutch (35) a reverse gear (39) incorporating the final transmission and a differential gear are inserted.

8. Infinitely variable gear as claimed in any of the claims 1 to 4, c h a r a c t e r i z e d in that the wheels (36) of the driven wheel-pair of the motor

vehicle are separated and at the inner end of all of the shaft-halves (38) belonging to the wheels (36) there is a reverse gear (39) containing the final transmission is arranged, and every one is connected through a belt-drive (41) or any other similar means to the driving belt pulley of the clutch (35) belonging to a second gear (33) each having been fixed onto the shaft facing the reverse gear (39).

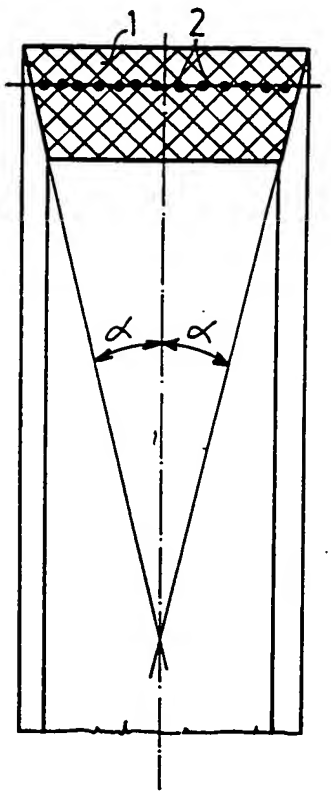

Fig.1

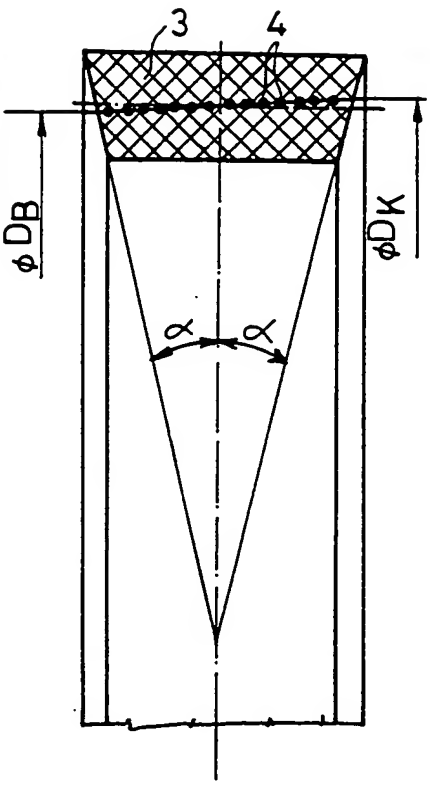

Fig. 2

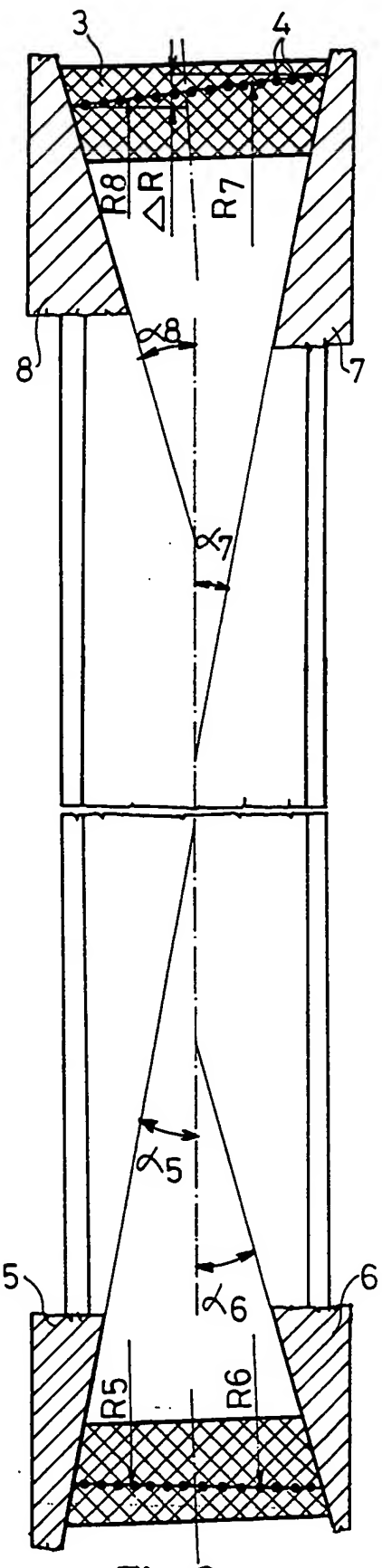

Fig. 3

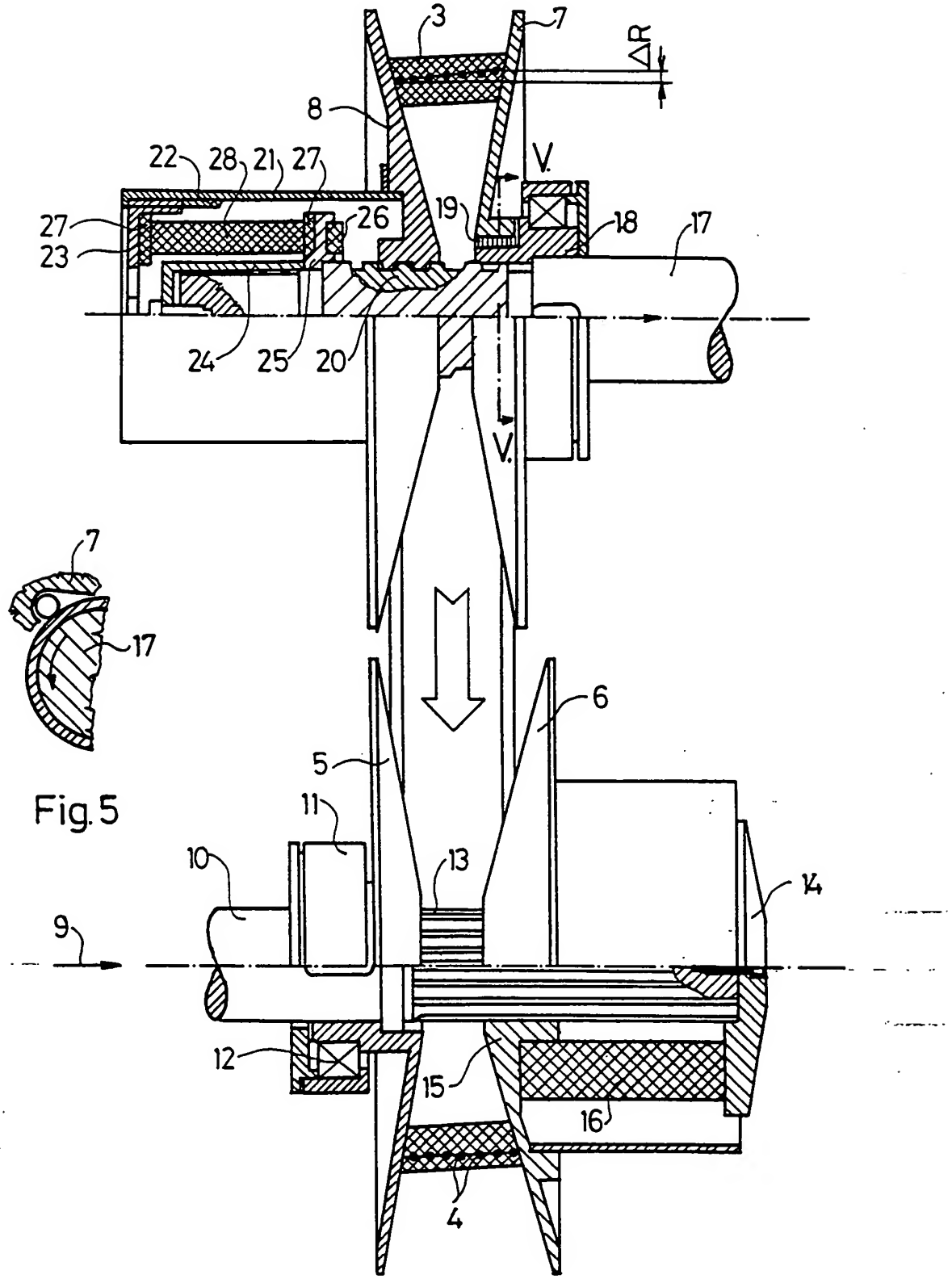
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Fig. 5

Fig. 4

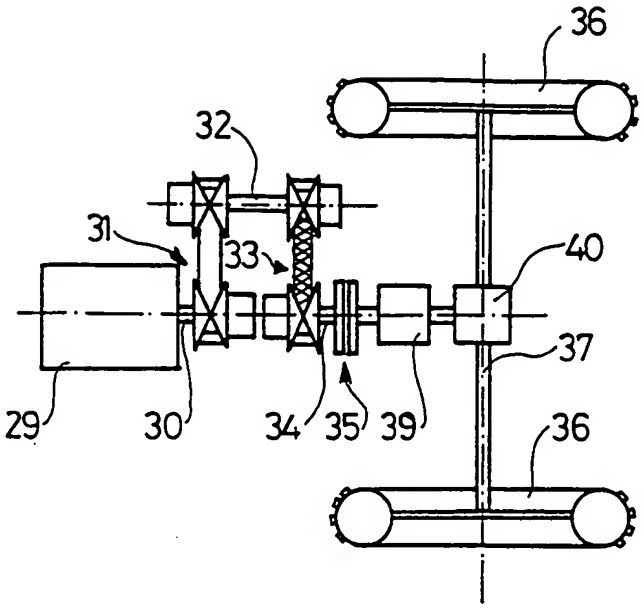
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Fig. 6

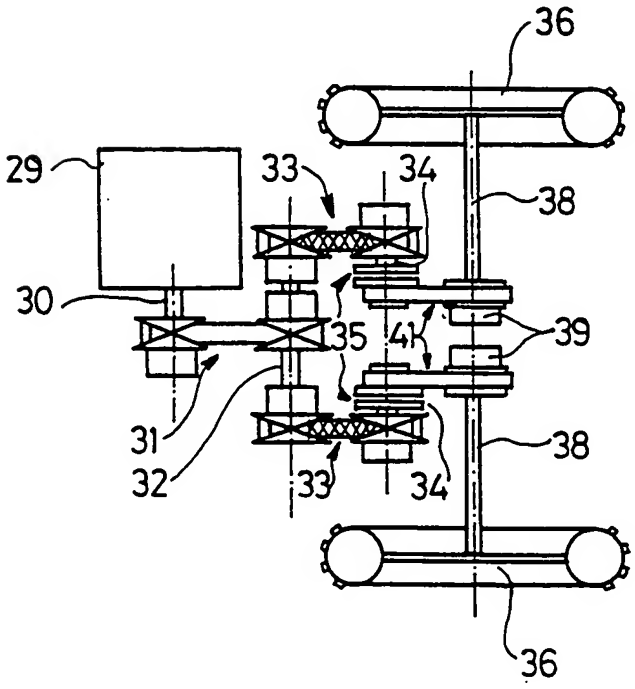
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Fig. 7

INTERNATIONAL SEARCH REPORT

International Application No PCT/HU 89/00005

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: F 16 H 11/06

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
Int.Cl.[4]	F 16 H 11/00,11/02,11/06,55/56

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	EP, A2, 0 083 501 (GATES RUBBER) 13 July 1983 (13.07.83), see totality.	(1-5)
A	US, A, 3 623 377 (LEWIS) 30 November 1971 (30.11.71), see totality.	(1-4)
A	DE, A1, 2 647 076 (HOFFMANN) 20 April 1978 (20.04.78), see fig. 1; claim 1.	(1-6)
A	DE, A1, 3 623 116 (WARNER) 15 January 1987 (15.01.87), see totality.	(1-4)
A	US, A, 4 568 315 (TOMIYORI) 04 February 1986 (04.02.86), see totality.	(1-4)
A	WO, A1, 87/07 349 (KABUSHIKI) 03 December 1987 (03.12.87), see fig. 1c; abstract.	(1-4)

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* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
26 April 1989 (26.04.89)	02 May 1989 (02.05.89)
International Searching Authority	**Signature of Authorized Officer**
AUSTRIAN PATENT OFFICE	

Anhang zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

Annex to the International Search Report on International Patent Application No. PCT/HU 89/00005

Annexe au rapport de recherche internationale relatif à la demande de brevet international n°.

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned International search report. The Austrian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche internationale visé ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office autrichien des brevets.

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